CLAIMS:

1. A spectral filter for filtering or transmitting at least one predetermined spectral wavelength band comprising:

a substrate or host wafer having a first and a second surface and further including plural, substantially uniform parallel uncoupled waveguides defined at least partially therethrough, the plural waveguides defining axes substantially perpendicular to the wafer first surface, the plural waveguides having coherently modulated cross-sections along at least some part of the length of said waveguides, the plural waveguides each supporting at least one waveguide mode at the predetermined spectral wavelength

2. A spectral filter of **claim 1** wherein said host wafer at least partially comprises porous semiconductor material, said semiconductor material remaining between the pores serving as a waveguides while said pores separate neighboring waveguides.

3. A spectral filter of **claim 2** wherein said semiconductor material comprises macroporous silicon.

4. A spectral filter of **claim 2** wherein said porous semiconductor material comprises porous indium phosphide.

5. A spectral filter of **claim 2** wherein said porous semiconductor material comprises porous gallium arsenide.

6. A spectral filter of **claim 2** wherein said porous semiconductor material is chosen from the full possible range of alloys and compounds of zinc, cadmium, mercury, silicon, germanium, tin, lead, aluminum, gallium, indium, bismuth, nitrogen, oxygen, phosphorus, arsenic, antimony, sulfur, selenium and tellurium.

7. A spectral filter of **claim 1**, wherein the wafer has a thickness of from about 1 to about 5000 times the characteristic lateral dimension of the waveguides.

8. A spectral filter of **claim 2** wherein at least one layer of substantially transparent material at the transparency wavelength range of said spectral filter is made to coat the pore walls.

9. A spectral filter of **claim 8**, wherein each layer of the transparent pore coating in said filter is a material selected from the group consisting of oxides, nitrides, oxynitrides and fluorides of metals and semiconductors.

10. A spectral filter of **claim 8**, wherein the said at least one layer of the transparent pore coating has a refractive index less than that of the semiconductor host and serves as a waveguide cladding.

11. A spectral filter of **claim 1**, wherein the filter comprises a transmission-type band-pass filter.

12. A spectral filter of **claim 1**, wherein the filter comprises a transmission-type band-blocking filter.

13. A spectral filter of **claim 1**, wherein the filter comprises a reflection-type band-pass filter.

14. A spectral filter of **claim 1**, wherein the filter comprises a reflection-type band-blocking filter.

15. A spectral filter of **claim 1**, wherein the centers of said waveguides are placed apart by a distance in the range of $0.5\mu m$ to $30\mu m$, said distance being greater than the smallest lateral dimension of said waveguides.

16. A spectral filter of **claim 1**, wherein said waveguides are spatially ordered in the plane of said wafer into a predetermined pattern having predetermined symmetry.

17. A spectral filter of **claim 16**, wherein said symmetry is hexagonal symmetry.

18. A spectral filter of **claim 16**, wherein said symmetry is cubic symmetry.

19. A spectral filter of **claim 16**, wherein said waveguides are disposed such that the waveguide pattern has a complex order having complex symmetry

20. A spectral filter of **claim 2**, wherein said pores have substantially circular cross sections.

21. A spectral filter of **claim 2**, wherein said pores have approximately square cross sections.

22. A spectral filter of **claim 1**, wherein said waveguides are made to exhibit a modulated lateral cross section over at least some part of the length of said waveguides.

23. A spectral filter of **claim 22**, wherein said modulation is periodical with the period from about 50nm to about 20μm.

24. A spectral filter of **claim 22**, wherein said modulation is the superposition of two or more periodical modulations with periods from about 50nm to about 20μm each.

25. A spectral filter of **claim 22**, wherein said modulation is made in the apodized form.

26. A spectral filter of **claim 22**, wherein said waveguides have more than one length segment of contiguous modulations along their depth separated by unmodulated segments.

27. A spectral filter of **claim 26**, wherein said length segments of modulation are of the same modulation and are spaced such that 180 degree optical phase shifts are formed between them, thus creating at least one narrow band of transmission through the filter.

28. A spectral filter of **claim 26**, wherein said length segments of modulation are of different periods and/or structures of modulation.

29. A spectral filter of **claim 1**, wherein said waveguides have at least one end tapered.

30. A spectral filter of **claim 29** wherein said tapering is created such that the waveguide cross section is gradually increased when approaching said waveguide end with the rate of increase being in the range of 1 to 55 degrees with respect to the waveguide axis.

31. A spectral filter of **claim 2**, wherein at least one layer of substantially absorbing or reflecting material is disposed on at least part of said pore length and said material is chosen to minimize the cross-coupling between the modes of neighboring waveguides.

32. A spectral filter of **claim 31** wherein said at least one layer of absorbing or reflecting material comprises at least one layer of metal.

33. A spectral filter of **claim 32** wherein said metal is chosen from the group consisting of Ag, Al, Cu, Ni, Fe, Au, In, Sn, Pt, Pd, Rh, Ru, conducting oxides, nitrides and oxynitrides of metals.

34. A spectral filter of **claim 31** wherein said at least one layer of absorbing or reflecting material is an alloy chosen from the full possible range of alloys and compounds of iron, nickel, cobalt, boron, zinc, cadmium, mercury, silicon, germanium, tin, lead, aluminum, gallium, indium, bismuth, nitrogen, oxygen, phosphorus, arsenic, antimony, sulfur, selenium and tellurium.

35. A spectral filter of **claim 1** wherein an antireflective structure is made to coat at least one surface of the host wafer, said structure minimizing the reflection of light from said waveguide material over the said predetermined wavelength range such that at least some portion of said each waveguide length is left uncoated by said antireflective structure.

36. A spectral filter of **claim 35** wherein the said antireflection structure comprises just one layer of the material known as an antireflection layer.

37. A spectral filter of **claim 35** wherein the said antireflection structure comprises a multilayer antireflection coating.

38. A spectral filter of **claim 1** wherein said wafer is disposed between two plates of material that is transparent in a predetermined spectral range.

39. A spectral filter of **claim 38** wherein said plates are made with both surfaces substantially flat and parallel.

40. A spectral filter of **claim 38** wherein at least one surface of at least one of said plates is of a lens-like shape.

41. A spectral filter of **claim 38** wherein the filter surface comprises a material that is plastically deformed to a predetermined non-planar shape.

42. A spectral filter of **claim 1** wherein said host wafer at least partially comprises oxidized porous semiconductor material, said oxidized semiconductor material between the pores serving as waveguides while the pores separate neighbor waveguides.

43. A spectral filter of **claim 42** wherein said semiconductor material is oxidized macroporous silicon.

44. A spectral filter of **claim 42** wherein at least one layer of substantially transparent material in the transparency wavelength range of said spectral filter is made to coat the pore walls.

45. A spectral filter of **claim 44**, wherein each layer of the transparent pore coating in said filter is material selected from the group consisting of oxides, oxinitrides and fluorides of metals and semiconductors.

46. A spectral filter of **claim 44**, wherein the said at least one layer of the transparent pore coating has a refractive index less than that of the oxidized semiconductor host and serves as a waveguide cladding.

47. A spectral filter of **claim 42**, wherein said pores have substantially circular cross sections.

48. A spectral filter of **claim 42**, wherein said pores have approximately square cross sections.

49. A spectral filter of **claim 42**, wherein at least one layer of substantially absorbing or reflecting material is disposed on at least part of said pore length and said material is chosen to minimize the cross-coupling between the modes of neighboring waveguides.

50. A spectral filter of **claim 49** wherein said at least one layer of absorbing or reflecting material comprises at least one layer of metal.

51. A spectral filter of **claim 50** wherein said metal is chosen from the group consisting of Ag, Al, Cu, Ni, Fe, Au, In, Sn, Pt, Pd, Rh, Ru, and electrically conducting oxides, nitrides, carbides and oxynitrides of metals.

52. A spectral filter of **claim 49** wherein said at least one layer of absorbing or reflecting material is an alloy chosen from the full possible range of alloys and compounds of iron, nickel, cobalt, boron, zinc, cadmium, mercury, silicon, germanium, tin, lead, aluminum, gallium, indium, bismuth, nitrogen, oxygen, phosphorus, arsenic, antimony, sulfur, selenium and tellurium.

53. A spectral filter of **claim 1** wherein said host wafer at least partially comprises porous semiconductor material, with the pores completely filled by a substantially transparent material, said filled pores comprising the cores of said

waveguides and said semiconductor material between the pores functioning to separate neighboring waveguides.

54. A spectral filter of **claim 53** wherein at least one layer of transparent material is disposed onto the pore walls between said pore-filling material and semiconductor material between the pores.

55. A spectral filter of **claim 54** wherein said material comprising at least one layer disposed between pore-filling material and semiconductor material has a lower reflective index than the pore-filling material and serves as a waveguide cladding.

56. A spectral filter of **claim 53** wherein said pore-filling material is selected from the full possible range of alloys and compounds of zinc, cadmium, mercury, silicon, germanium, tin, lead, aluminum, gallium, indium, bismuth, nitrogen, oxygen, phosphorus, arsenic, antimony, sulfur, iodide, selenium and tellurium.

57. A spectral filter of **claim 53** wherein said pore-filling material is a germanium doped silica.

58. A spectral filter of **claim 53**, wherein said pores have substantially circular cross sections.

59. A spectral filter of **claim 53**, wherein said pores have approximately square cross sections

60. A spectral filter of **claim 1** wherein said spectral filter is disposed contiguous to an optical detection means.

61. A spectral filter for the green or longer wavelength range comprising:

a substrate; and

plural substantially uncoupled waveguides defined through said substrate, said waveguides having coherently modulated cross-sections over at least a portion of their extents, the plural waveguides supporting at least one waveguide mode in the green or longer wavelength range.